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EDITORIAL

In a month or so, the many hundreds of high schools throughout the country will graduate many thousands of students. If past records are repeated, 20 to 25 per cent. of these graduates will enter institutions of higher education. A representative number of them will enter into the study of pharmacy, and will, accordingly, apply to the retail pharmacists of the nation for positions as apprentices. This editorial, which appeared in the AMERICAN JOURNAL OF PHARMACY *for August, 1928, is, accordingly, extremely suitable for reprinting at this time.*

"UNPREPARED AND UNINSPIRED"

MORE THAN ONCE we have taken to task, in these columns, those whining romanticists who everlastingly deplore the passing of the "good old days." For these people the past has only the pleasant, and the present is brimful of woe.

We have often asked such antiquarians if they would change their comfortable present environment, were that possible, for a time in the past—their "good old days"—when pulse-warmers and antimacassers were real luxuries.

No, indeed—for if comforts and luxuries be the only criteria of content—the *new* days are the *good* days.

The new days have given us speed in comfort over velvet roads—and sky trips in canvas tubs with no Icarian qualms about our safety.

For us operas diffuse through clouds and perfectly dry lectures are electronned through rainstorms.

We dress ourselves in lustrous garments, chemist-carpentered from pine and poplar—yet silkier and scroopier than ever a silkworm could spin.

Children of the slums today wear clothes giddy with colors which, once upon a time, graced only such as the Queen of Sheba and Tyrian princes.

We turn night into day with the click of a switch—and summer's warmth caresses every winter day—if the oil burner is in good humor. From Orient and Occident come viands to our board—food, which once was served only to kings and emperors.

In the "new" days the humblest enjoy such gastronomic sprees that once were so exclusive.

. . . . . .

And so we might go on—and on—*ad nauseam.* But we are off the trail. What impelled this writing, after all, was a suspicion that there was a kind of a "good" in the good old days that is lacking in the new day and generation.

Elsewhere a sentiment has been expressed that our single hope is that when a lull in material progress arrives, inventors out of work can find much to do in directing the course of earth to a much-needed spiritual recrudescence.

And there, perhaps, is where the "good old days" were "good."

It was in those days—though not so long ago, that the writer commenced his career in drugdom. He now recalls his first employer—and remembers, with gratitude and affection, the interest he took in the crude, long-legged apprentice who had come to "learn the business" at his establishment.

How diligently he labored to set us straight with the problems of his busy shop!

"Don't dry those tincture bottles mechanically, son—but read every label and try to classify and remember them."

"Oil and water won't mix, boy—but a little gum of araby and a speck of secundem artem—and you've got them together to stay."

An old Dispensatory—hardly portable—was one offering he made upon the altar of our early training—and how we consumed its multifarious contents. Every day we pestered him with new questions and every question would bring a cheerful answer.

And then there is the day—that ominous home-leaving day—when with his counsel and material help we started off for college—and started *right* if an inspiring preceptorship counted for anything!

That was in the good old days! But how different are things today. How little interest the average preceptor takes in the young-

ster entrusted to his care (and perhaps, too, how blasé is the attitude of the average young apprentice—whose high school has trained him in just that way).

Yet the preceptor's responsibilities to his young charges are quite as clear as ever. Drug store experience is rather uniformly a prerequisite to State Board registration, but unless employers acquire a different viewpoint and practice a different technic the whole proposition becomes an idle gesture and a farce.

Young people commencing their institutional training come to their tasks unprepared and uninspired—with their employers largely to blame. It is a great concern, today, with pharmaceutical educators as to how conditions might change for the better.

And so we say that in these respects, at least, the good old days were very good—and the sooner pharmacists come to appreciate their obligations and their opportunities in this direction, the better it will be for the new day of Pharmacy.

IVOR GRIFFITH.

ORIGINAL ARTICLES

BLOOD AND THE CRIMINAL*

By Louis Gershenfeld, Ph. M., B. Sc., P. D.

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ALMOST everyone today recognizes the valuable service that chemistry and microscopy can render in the administration of justice. It is generally conceded that they can supply worthwhile information in all instances where the composition of articles as revealed by analysis may throw some light. The services of the chemist and microscopist are not known or sufficiently recognized in connection with crime except perhaps in cases of poisoning where they are accepted as being indispensable. There is however more widespread recognition in European countries than in this country, of the important role which science can play in the detection of crime. It is indeed unfortunate that more use is not made in America of the possibilities which scientific methods can offer to serve in crime detection. After all the commission of crime is regarded as an offense not necessarily against the person but against the state, inasmuch as the state by guaranteeing equal protection to everyone living within its domain must enforce punishment against anyone who infringes such guarantees. It must always be remembered that the burden of proof is on the accuser in a criminal prosecution and it behooves the state as a sacred duty to employ every acceptable means which is available to prove that evidence corroborative of crime is beyond the question of doubt what it is presented to be. Otherwise conclusions will result which will be fraught with terrible consequences.

Louis Gershenfeld, Ph. M., B. Sc., P. D.

*One of a series of Popular Science Talks given at the Philadelphia College of Pharmacy and Science during 1936.

In the trial of criminal cases, an important task encountered and undertaken by a scientific jurist is the identification of certain spots, suspicious as being human blood, in order to fix the guilt or attest the innocence of an accused. Scientific methods have been employed with this end in view and the weight of this testimony alone has frequently resulted in the conviction of the guilty or in an acquittal of the innocent. In treating of this subject, it requires more than a knowledge of chemistry, the scope of which must be extended to include several accessory methods which in strict classification might be assigned to other branches of science. It is of sufficient import to direct your attention to the fact that there are many kinds of chemists and only a very limited number are qualified by training and experience to cope with the many branches of science which are called upon to identify a suspicious stain as that due to human blood. Furthermore the one who is to act as the scientific jurist must be not only more than a mere chemist or scientist or even one highly specialized in analyzing the material submitted, but he must be possessed of a vast amount of knowledge and facts related to the application of the field of chemistry in the service of the law. With such knowledge he is in a position to present scientific facts that are capable of proof. He may then make deductions and express opinions, thus serving as an expert witness. It is high time that we in this country recognize the value that the scientific expert can give to aid in the detection of crime and each state in the union should make available for the policing units within their respective jurisdictions such capable experts. I have seen some of these so-called experts who may have been good political proteges but could not be labelled even poor chemists, let alone scientific experts. Yet they are ready and in some cases with which I am familiar did swear to scientific facts which the undergraduate in a science course in college could prove was not correct. In criminal cases in particular, expert evidence should be truthfully expert. It is not uncommon even to find that the position which a man has attained in the professional world may sometimes carry weight out of proportion to his experience in the special branch of the particular subject for which he stands ready to pose as an expert before the court. Where incarceration for a long period of time or even the life of an accused person may be involved, no one should pose as an expert in the investigation of the

character of stains unless such individual has had extensive experience in this line of inquiry.

Blood Stains

The necessity of testing colored stains that look like blood as an aid in the detection of crime is evident to all. The color of blood stains varies depending upon many factors such as the material on which the blood was found, the amount and thickness of the layer of blood present, the atmospheric conditions (temperature, humidity, exposure to sunlight, rain, dew, or snow) to which the stains were subjected, the age of the blood stains, and attempts to wash out blood with water, or naphtha, gasoline, and other cleaning fluids, leaving a faintly colored residue. The number of substances which may impart a color resembling the different shades of blood stains is exceedingly large. Among the latter we find: The vegetable and artificial coal-tar dyes (especially the latter and today so common due to the use of lipsticks and rouge); iron rust; fruit juices (as in jams, jellies, syrups, made from strawberries, cherries and grapes), and liquors; red ink; vegetable juices (as beets); sealing wax; paints and varnishes; such chemicals as the iron salts, Venetian red, red ochre, vermilion; cochineal; carmine; petals of different flowers; meat, coffee and tea; such drugs as sanguinaria, Brazil wood, red saunders, catechu, kino, anatto and Madder; fecal matter; highly colored urine; and even bacteria producing pigmentation.

Receiving the Article Containing the Suspicious Blood Stain

The expert must observe certain precautions even before he analyzes the stain. Wherever possible the collection of the specimen in cases of criminal investigation should be made by the scientific expert himself. In visiting the scene where the crime was committed, a detailed examination is conducted, the conditions carefully noted and recorded fully, photographs which may be of value are made, and he then can take with him such samples properly labelled with full particulars as in his judgment he thinks will be essential to the elucidation of the problem at hand. When suspicious stains are found on doors or other removable objects, it is best for the expert to remove the entire door and take with him the removable object. Even when stains are found on immovable objects as on floorings and walls, it is best to dislodge bricks or stones or remove a whole pane of glass

from a window or saw the flooring containing the stain and bring or send these to the laboratory. It is easier and more satisfactory to make examinations on such stains of dissected portions of immovable objects rather than obtain the scrapings of the dried suspicious blood stains. The stains on the implement or garment, or other material must be examined critically, and an accurate notation must be made of the position of the stains on the material under examination. The expert may detect minute blood stains which might be overlooked by the inexperienced as the former knows that blood stains are best seen by artificial light. In the case of clothing, a careful examiner will observe closely those parts of wearing apparel which are most likely to be overlooked by the accused in the washing up process as in seams of clothing, cuffs of shirt and pants, around buttons and button-holes, inner lining of pockets, soles of shoes, and under finger nails. Unless the expert visits the scene of inquiry and collects his own samples, one may find that at times something essential to the elucidation of the problem may be omitted or objects to be shipped or conveyed by the inexperienced may be handled in such an unsatisfactory manner as to result in interferences with proper scientific investigations. Stains on friable objects as soil, plaster, tissue and leaves, require special packing. The identity of all substances submitted to medico-legal examination must be established with absolute certainty and every precaution must be taken to insure this result. Wherever personal visitations at the scene of the crime are not practicable or for other reasons are not made, the properly-identified blood-stained articles packed or handled carefully should be received by the expert himself and he should not relinquish either those he collects personally or the ones which he receives, until he testifies in court. It is of sufficient importance to emphasize the fact these articles must never leave the personal custody of the expert and should not be left about or unnecessarily exposed in any way. It is advisable to see that whenever the package is opened it is done by the expert himself. Before he proceeds to analyze the suspicious stain a complete description of the package, when and how it was received, and a detailed description of the appearance of the article itself contained therein including all identification and distinguishing marks should be recorded. Everything as collected or received should be kept, even the original wrappers. The position, size, color and general appearance of each individual stain on the article or articles

to be examined should be made. A photograph or if this is not possible an outline sketch will be found to be helpful. Different stains or different batches or lots of suspicious blood are to be collected and examined separately, so as to avoid any possible confusion which may arise if such blood may have been shed by different animals.

The Macroscopic or Gross Examination of the Suspicious Stain

In Taylor's Forensic Medicine, accounts are given of trials in the early days where unskilled witnesses testified to the fact that certain stains were blood or looked like blood. Such evidence was most frequently accepted as conclusive and suspects were convicted on this lay testimony of the gross appearance of stains. Many accused were sentenced to pay fines and stand in the pillory due to the presentation of such weak evidence and more than likely many mistaken inferences were reported.

Everyone knows what freshly shed blood looks like but it is a most difficult matter to determine from the gross appearance only that certain stains on soil, missiles, metal, stone, wood, clothing, leather and on other materials containing absorbent or non-absorbent surfaces are really that of blood. The color of blood stains on different materials will vary markedly from a dull red or reddish brown to a reddish or dirty gray depending upon exposure and the other factors previously mentioned; or it may be very light in color having been washed out by rain or even water. In the latter instance it may have been a purposeful act by the accused to get rid of the evidence of his guilt. On polished metal, the appearance of blood stains is as dark shining spots and they are easy to remove. It is evident to most all that today testimony on the color of a suspicious stain even when the latter covers a large area would in itself not be admitted as sufficient evidence to regard such stain as blood. Yet on the other hand, a description of the color and general macroscopic appearance of the suspicious stain as to incidence, magnitude and character should be carefully noted. This includes such factors as the size or amount of blood present, shape and the dryness or hardness of the blood stain. Valuable information or deductions may be obtained by such observations and by other facts as for instance: The position (including a knowledge of the side on which the blood was found), size, shape and number of stains or whether the latter are in pools, sprays, jets,

spots, splashes, smears or drops or even the direction of a spray of blood to the position of a body when found. Venous blood is more apt to be present in large quantities and "en masse," while arterial blood generally produces a large number of small stains situated very close together and possesses an appearance closely resembling insect marks. The appearance of sprays of blood will be influenced by the fact as to whether the blood flowed from a wound while the individual was at a standstill or while running. A careful search using even a hand lens must be made to detect the presence of any extraneous substances such as hairs of human or other animal origin, fragments of bone, skin or other tissue, fabrics, fibers, wood, mineral substances, or other foreign materials. Likewise bloody footprints or finger prints on blood stains are to be observed. It is impossible to establish the age of dried blood stains as the appearance of the latter is markedly modified by various contingencies. The solubility of blood stains in different dilutions of certain chemical solutions was said to be of value as a means of determining approximately the age of blood stains, but this factor was found to possess little value as a means of fixing the age.

In medico-legal investigations especially where the identification of suspicious stains are involved, the analyses should be conducted in such a manner that contamination is impossible. The apparatus used should be kept apart for these analyses only and clean vessels should be employed at all times in the examinations. At every stage of the investigation, accurate notations should be made. If the expert requires assistance in the performance of any of the tests, he however must personally carry out all of the more important operations and he should see or verify the other details. Control or blank (positive and negative) experiments should be conducted at the same time as the unknown or suspicious stains are being examined for the presence of blood. It is the expert himself who will give the evidence in court; and being sworn and therefore responsible for the conclusions submitted, he must be in a position to justify the latter. He cannot afford to neglect or discount any of the previously mentioned details. Where the death or liberty of another is concerned, criminal lawyers take advantage of every loophole, and every action and finding of the expert is liable to be subjected to the strictest scrutiny and adverse criticism.

Examining the Stain to Determine Whether It Is Blood

Other than the gross or macroscopical observation, the examination of colored stains to detect whether they are blood comprises three different kinds of determinations: (1) Chemical and physico-chemical; (2) microscopical and microchemical; (3) biological, immunological or serological.

In most instances in applying the tests to suspicious stains, it is more satisfactory to bring the substance responsible for the stain into solution or suspension and then to use the latter in making the tests. For this purpose a piece of the apparel, wood or object on which the stain is present is soaked or steeped in a weak saline solution (0.85 per cent. salt). The best procedure is to cut out portions of the stained material and soak them in the latter solution. In some instances the use of various chemical solvents may be necessary to bring into solution or suspension stains of long standing or which have been acted upon or fixed by chemicals present in the material upon which the stain is found, or if a high heat may have been used as after ironing apparel containing such stains. However, a weak saline solution has been found in most instances as the most satisfactory of all solvents and the varying factor is the time allowed in the steeping process. When prolonged soaking (over night or a day or longer) is necessary, it should be carried out in a refrigerator so as to avoid bacterial decomposition. At all times, a portion of the identical apparel, leather or material under investigation and upon which there are no stains is treated in the same manner as is the portion containing the colored stain. This extract serves as a negative control and each and every technique employed in examining the suspicious stain is performed on known blood samples (as the positive control) and on this negative control. False or misleading reactions may thus be detected, due to the fact that the material may contain chemicals (as tannic acid in leather or iron on other objects) which react with the reagents during the testing. Stains upon hard surfaces which cannot be soaked are scraped off and suspended in saline solution.

Chemical and Physico-Chemical Observations

A most interesting study is to note the procedures employed in days gone by, where as mentioned suspicious colored stains were reported as being blood merely by a sworn declaration that the stain

looked like blood. This was followed by the evolution of many scientific procedures until the introduction of the present-day elaborate and more exacting methods. It would serve no useful purpose to detail or enumerate the many chemical tests used formerly, and which interfered with the cause of science and justice. I however will direct your attention to the test devised by Burrel in 1829 and upon which great stress was laid in former days. This was the sulfuric acid test, which for a number of years was employed all over Europe and many murder cases were decided by it. In this test one and one-half parts of the acid were added to one part of the blood, the mixture was heated, and it was claimed that an odor or smell was produced if blood was present. Of even greater import was the statement that it was possible to establish the source of the blood as the odor developed by this test was peculiar to the animal from whence the blood came. No scientist today would attempt to make such an assertion.

The so-called chemical tests for blood in use today are in reality tests for hemoglobin only, the latter being the coloring matter peculiar to the blood of any warm-blooded animal. It is found in the blood of many of the invertebrates and of all vertebrates with the possible exception of the amphioxus and leptocephalus (glass fish). Many of you are familiar with the fact that hemoglobin is present in the red cells, and that the white cells and the serum (the liquid portion) are other components of human blood. From the point of view of the scientific jurist, only the red cells, its pigment hemoglobin and the serum are the constituents of the blood which have been found to be of service in solving the problems concerning the identification of suspicious colored stains as that of human blood. Macroscopic or naked-eye observations, chemical and physico-chemical examinations of blood "en masse" may enable a worker to state that blood is present, but these tests alone cannot distinguish human blood from that of other animals.

Detection of Blood by Methods Depending Upon the "Peroxidase" Property of Hemoglobin—The red coloring matter of the blood, hemoglobin, which contains iron, liberates oxygen from peroxides. As far back as 1871, Zahn called attention to the fact that when blood-stained material is brought in contact with hydrogen peroxide, there is evident an evolution of gas bubbles. Gantter, in 1895, noted that the absence of froth when peroxide of hydrogen is

mixed with material containing suspicious stains in solution or suspension is a good presumptive evidence of the absence of blood. In 1905, Palleske reported similar findings. More satisfactory tests were soon devised in which it became possible to observe a color change, if immediately before using the peroxide various chemical reagents were first added. In 1900, Schaer and later Utz used a 2 per cent. solution of aloin. Isaac Van Deen, the Holland physician, used a 2 per cent. alcoholic solution of guaiac and later a 1 per cent. solution of guaiaconic acid was recommended. The guaiac test for hemoglobin is also known as Day's test, after Dr. John Day and as Schönbein's test, he having proposed its use in 1861. It is also spoken of as Almen's or Vitali's tests. In 1904, O. and R. Adler recommended the use of benzidine. Ruttan and Hardisty suggested the use of a 4 per cent. solution of orthotoluidine in glacial acetic acid, and J. H. Kastle and O. M. Shedd, of Lexington, Kentucky, advocated the use of phenolphthalin. The detection of hemoglobin in these chemical tests by noting a color change is a quick and easy method, serving as the best preliminary procedure to determine whether a suspicious stain is likely to be blood.

In the test the following technique is used. A portion of a solution or suspension of the suspected stain is placed in a test tube or (if only a small amount is present) a few drops are placed in a watch glass crystal. To this is added an equal quantity of the particular reagent followed immediately by from several drops to an equal volume of solution of hydrogen peroxide, or the reagent to which the peroxide was added is mixed with the extract of stain. Instead of hydrogen peroxide, ozonized ether and ozonized oil of turpentine have been used. A color change is noted within ten to fifteen seconds. In the guaiac test, a violet or sapphire-blue color is produced if blood is present. A blue or bluish-green color is produced in the benzidine test and a blue color is observed in the orthotoluidine test. A red color becoming purple-red or cherry-red is observed in the aloin test, while a pink or red color results in the phenolphthalin test. Weaker colors will result if the concentration of hemoglobin is low. In the test proper, it is advisable to see that the same technique is employed against known blood solutions (as a positive control) and against an extract of a portion of the same garment or other material but where stains are absent (as a negative control). The delicacy of these chemical tests for blood varies de-

pending upon the reagents used, the purity of the latter, and upon the concentration of other substances present with the blood in the extracts. The guaiac test will detect blood in dilutions of 1:5000 to 1:40,000 and some have claimed that positive results are possible in dilutions as high as 1:100,000. The benzidine test is capable of detecting blood in dilutions of from 1:100,000 to 1:300,000 and under some conditions when highly purified reagents are used, the test is stated to detect blood when present in a dilution of 1:3,000,000. The phenolphthalin test will readily detect blood in a dilution of 1:300,000 or 400,000 and positive findings can be obtained under certain conditions in dilutions even as weak as 1:8,000,000.

There are many substances as gluten, plant juices, milk, bacterial growths, pus, feces, sweat, gum arabic, potato pulp, flour, peas, oats, tomatoes, chemicals as iron, chromium, cobalt, lead, manganese and copper compounds, which if they are present in the negative control may at times give an almost identical color reaction with some of the above reagents. Many of these interfering or contaminating substances do not respond to this test as does blood solutions if the solutions are first boiled for several minutes. This should be practiced before carrying out the test so as to avoid any possibility of a false positive reaction being obtained. This objection does not apply to as great an extent or degree when using the phenolphthalin test. It is for this reason that the latter is employed as one of the chemical tests for blood especially in medico-legal investigations, where interfering substances as mentioned above are apt to be present in the extracts or solutions under examination. The phenolphthalin test may be applied directly to the stain even without extracting the latter. The absence of a color reaction (that is negative findings) in any of these techniques is practically conclusive that blood is absent. The main value of these chemical tests for blood is in their negative findings. Portions of stains yielding positive reactions are to be tested for more conclusive and additional corroborative evidence of the presence of hemoglobin.

Crystals of Haemin (*Haemitin Hydrochloride*)—There are many confirmatory tests for blood and all or as many of them as possible should be used as evidence of the findings. The production of haemin crystals is a valuable microchemical test. If blood, present on fibers or in a drop of a solution or extract, is heated carefully and gently for a short time with a drop of glacial acetic acid and a

minute quantity of sodium chloride (common table salt), characteristic crystals of haemin (haemitin hydrochloride) are deposited on cooling. This is called Teichmann's test named after the histologist, Ludwig T. S. Teichmann, who introduced this technique in 1853. There are many methods of carrying out this procedure, the direct heating technique on a glass slide and Beam and Freak's modification (presented in 1915 by W. Beam and G. R. Freak) being the technique of choice. The haemin crystals which are produced by the blood of all animals will be found if examined microscopically to have a yellow to dark or chocolate-brown color, and they appear as long, narrow, thin, rhombic plates overcrossed as in an X or in clusters like a star fish.

The production of haemin crystals is often difficult and in some instances either due to the action of heat or to other interfering substances in the material containing the stain, negative findings may result even though blood is present. It is on this account that the statement is made that a negative haemin crystal test does not necessarily exclude the presence of blood. This test is extremely delicate and is a very important and positive test for blood pigment. Though in its detection of hemoglobin it reveals with certainty the presence of blood, it does not however throw light upon the specific animal from which the blood came.

Spectroscopic Examination—Among the confirmatory tests, the spectroscopic examination for blood originally introduced by Hoppe-Seyler in 1862 is also a most valuable method. It is simple in its application, can be employed where only a very small amount of material is available and the results are decisive.

It is not possible in an article as this and perhaps it would be too technical to explain the spectroscope and the technique in spectroscopic examinations. In brief, may I direct your attention to the fact that the spectroscopic test for blood consists in passing light through a suspected medium (preferably through a solution or extract of the stain) contained in a tube and placed in an apparatus fitted with a prism interposed between the light and the eye of the viewer. The ray of light is broken up by the prism into the component elementary colors of the spectrum—red, orange, yellow, green, blue, indigo and violet. The presence of blood pigment even in any of its altered forms will result in the absorption of certain or parts of the rays of light which will cause corresponding dark bands in

the spectrum. The blood spectra being known, and being given by no other pigment, it becomes possible after control tests are made to identify with certainty from the spectra which may be found in unknown material under investigation whether blood pigment is absent or present. In dealing with small quantities of material, the microspectroscope is used. The latter fits into the eye-piece opening of the ordinary microscope. Though this is an infallible test for blood pigment irrespective of the age of the stain in which it may be present or of the conditions to which the stain may have been subjected, the spectroscopic examination cannot be employed in a differential diagnosis to determine the specific animal blood with which we are concerned.

Haemochromogen (so-called reduced haemitin) is formed when blood is treated with alkali and a powerful reducing agent. Beautiful ruby red though at times ill defined crystals can be observed under the microscope in this test, when using the technique employed to produce them (pyridine method). Some workers regard the technique for obtaining haemochromogen crystals and the subsequent examination of the latter with the microspectroscope as a delicate and valuable test for the detection of blood pigment.

Microscopic Examination of Stains

The layman and even some in certain branches of science have the erroneous impression that with chemical means alone and without the aid of the spectroscope, microscope or serological procedures, it is easy to determine whether a given stain is due to human blood. I believe I have shown that chemical, microchemical and spectroscopic examinations if properly carried out with the employment of controls will even if positive indicate only that hemoglobin is present. The medical jurist must first prove by the many scientific tests available that the suspicious stain is hemoglobin. The next and just as, if not a more important question which arises and which he must try to answer, is to determine whether the hemoglobin found comes from blood shed by a man or by other animals.

It is of the greatest value to be able by any means however difficult or tedious to distinguish the blood of man from that of another animal. Mention was made previously of an attempt in days gone by to distinguish human blood from that of other animals by the odor evolved when extracts of the suspicious stain were mixed with sulfuric acid. We know today that it is not possible in a medico-

legal investigation to distinguish different bloods by this technique. It is not only dangerous but no attempt is even made today to rely upon such a procedure in medico-legal cases. On the other hand it was not many years ago that some medical jurists who would say (rightfully) that human blood cannot be distinguished from that of animals by the naked eye or by any physical or chemical test would state with all assurance that the differentiation rests entirely upon the microscopical appearance of the stain and chiefly upon the microscopical appearance of the red corpuscles present.

A microscopic examination of the scrapings or of an extract of any suspicious stain is of great value as the most important of the confirmatory tests or to aid even in supplying additional information as will be presented briefly. Microscopy and microscopic techniques in medico-legal cases should be carried out by those experienced in such procedures. But it is to be remembered that microscopic methods cannot always, should not be and are not used as the only test by careful experts to enable them to affirm whether the suspicious stain is composed of human blood. Honesty makes an imperative demand upon scientific experts to use all available means in the present state of our knowledge before arriving at definite conclusions. Otherwise these same experts may become more dangerous to society than the very criminals they are trying to convict. The practice in vogue is to make an extract or a suspension of the dried material on the suspicious stain using a weak salt solution (0.9 per cent. salt) or if this is impossible the scrapings are obtained. Either one is examined microscopically at once. If red-blood cells are found, such positive findings aid materially in the further investigations. A careful search should also be made for other structures during the microscopical examination.

A careful observation of the appearance of the red-blood corpuscles (known also as erythrocytes) under high magnification is of great value in identifying a suspicious stain as that of blood and occasionally a differential diagnosis may be possible. In the latter instance it is possible either in stained or unstained preparations to observe that the shape of the red corpuscles of oviparous blood (non-placental or non-mammalian animals as birds, fishes and reptiles) differ from that of the corpuscles in mammalian blood (placental animals). The red-blood corpuscles of the former are invariably larger than that of mammals, more or less convex, oval or

elliptical (with the exception of the lampreys of the fish group in which the cells are spherical) and they all possess a nucleus, the latter being large and usually oval in shape. The red-blood cells of mammals do not possess a nucleus. They appear in most all instances as circular bi-concave discs, with the exception of the camel and llama tribes. The red-blood cells in the latter are oval in shape. It is however in the finding of the presence or absence of a nucleus in red cells found in suspicious stains that the microscopic examination serves a most valuable purpose.

The main difference to be observed microscopically between the red-blood corpuscles of mammals is the difference in the size of the cells in the various species. This distinction which whenever it can be should always be made is established by micrometry wherein the diameter of the corpuscles under observation is measured. The average size of the red corpuscles of human blood is approximately 7.8 microns (1/3200 of an inch), much larger than the average size of the corpuscles of most domesticated animals, whose blood contains red cells otherwise appearing as that of human blood cells. The average thickness is 1.84 microns (approximately 1/13,600 of an inch) and the cubic content averages 87 cubic microns. There are times when the red corpuscles in human blood may be found to vary considerably from the mean or average size. The red cells of the human foetus are found to average 1/3000 of an inch in diameter and occasionally are even much larger than that of the red cells in adult human blood. One must also keep in mind that oval or elliptical and irregularly shaped red-blood cells and even some nucleated erythrocytes may be found in specimens of human blood obtained from deep seated organs and tissues or from individuals suffering with certain diseases. The error that may be caused by such conditions is the possibility these findings may not be considered as human red-blood cells. Nuclei in the latter present in abnormal cases are smaller and of a different appearance than observed in non-mammalian bloods. Instead of being present in every cell as in non-mammalian specimens only a small percentage of red cells in abnormal human blood will reveal such nuclei. Animals other than humans (and possibly the dog) which as as a rule are said to be responsible for blood stains in medico-legal cases have red corpuscles which are less than 1/3500 of an inch in diameter. The following indicates the approximate average diameter of the red cells of different mammalia, other than

man: Cat, 1/4400 inch; dog, 1/3550 inch; goat, 1/6300 inch; horse, 1/4500 inch; monkey, 1/3400 inch; mouse, 1/3800 inch; mule, 1/3750 inch; pig, 1/4250 inch; rabbit, 1/3630 inch; rat, 1/3700 inch; and sheep, 1/5100 inch. There is of course the possibility that in the defense of criminals improper use may be made of micrometry if this alone (and this is never done today) was to be used as a means of attempting to identify human blood from that of the blood of other animals whose red-blood corpuscles approach in size those of man.

With fresh blood, there is generally very little difficulty in distinguishing between mammalian and non-mammalian blood by microscopic methods. It may be possible to measure with ease the size of the corpuscles in the fresh blood stain with the thought of differentiating different mammalian bloods though the present limits of scientific techniques make this impossible as an absolute method of identification. It must also be remembered that in medico-legal cases it is rare that the expert is called upon to identify freshly made stains. In the majority of cases a length of time elapses between the commission of the deed and the examination of the suspected stain. The latter may be very small. The appearance of the blood elements may have been markedly altered due to exposure to sunlight, heat, rain, dew, or humidity, so that size, shape, and other microscopical appearances of the red corpuscles are difficult or even impossible to recognize, and they cannot be restored to their original character. As mentioned previously the blood may also have come from the deeper and not the superficial tissues of man or may show alterations due to diseased conditions or due to an unsatisfactory method of treating the stain. It is therefore evident that the use of microscopy is only of value as a confirmatory test to detect the presence of red-blood cells in suspicious stains. If the cells under consideration have not presented much alteration, the only thing possible is to attempt to differentiate between the two big classes, mammalian and non-mammalian red-blood corpuscles. Even with a considerable amount of practice, experts find it difficult to distinguish with certainty by microscopy the different kinds of mammalian bloods. The finding of nucleated, oval cells indicating it is not human blood is of great negative value. The exact animal to which the corpuscles belong should not be and the careful expert does not attempt such determination by microscopy alone. One is never justified in placing a man's life in jeopardy on the strength of determina-

tions which in themselves are dubious or uncertain. If the blood causing the stains under consideration presented corpuscles which could be easily identified, the expert would do well to substantiate his testimony by microscopical slides prepared from the blood stains and if possible present microphotographs of these slides.

Sometimes the following condition prevails. Blood stains are admitted as being of human origin, but the question arises whether the blood is menstrual and occasionally whether it is derived from hemorrhages of various kinds, especially from the nose or due to staining from piles or from a sore. Microscopy can be of service here, as microscopic techniques may reveal the presence of structures mixed with the blood which in turn are peculiar to certain parts of the body, indicating their exact source. Finally may I direct your attention to the fact that microscopy may aid in identifying other foreign structures found with the blood (as hairs, fibers, etc.), which may present a direct connecting link between the accused and their guilt or innocence.

Tests of Doubtful Value in Medico-Legal Investigations

There are many tests that one may find as having been recommended as reliable aids in identifying suspicious stains as being human blood. For instance, one prominent worker reported about thirty-five years ago that the changes undergone by red cells during the process of drying are characteristic for each species of animal, and this can be employed to differentiate the different kinds of blood. He even went as far as to state that in all species the red corpuscles of the female when dry tend to appear differently from those of the male. Workers have reported from time to time that crystals of hemoglobin can be obtained from blood and that there are pronounced differences in the forms and even in the color as observed microscopically between the crystals which can be separated from the blood of humans and that of different animals. Drs. Reichert, E. T. and Brown A. P. presented a very complete study of hemoglobin crystallography in man and animals, and these workers in particular showed that the hemoglobin from the various species reveal different crystalline structures. Unless fresh blood is available however, the differentiation of bloods by the crystallography of the hemoglobin which appears to be specific is impossible. Even when large amounts of fresh blood are at hand, this method is of no great importance from a medico-legal viewpoint.

Many of these tests just as the sulfuric odor test are only of historical interest and in reality interfere with the cause of science and justice. In the remaining few, one will find that they have either outlived their usefulness or many difficulties present themselves, making it impossible to employ them in medico-legal cases as positive means of identification. In the long run in medico-legal cases, it is best to avoid the use of tests that are inconclusive or doubtful, as frequently such evidence may result in doubt being placed on the expert's testimony even though many other tests of real merit were presented.

Biochemical Test (Serological or Immunological or So-called Precipitin Test)

The chemical and microchemical tests, spectroscopic examination, and the production of haemin crystals if positive (and the controls are negative) indicate that hemoglobin is present. Microscopical observations may detect the presence of red corpuscles and may (more so in the case of fresh blood or blood recently shed) reveal the class to which the red cells belong, either mammalian or non-mammalian. It was not until the last quarter of a century that a test was presented and employed in medico-legal cases making it possible for the expert to state with a positive degree of assurance that the stain was due to blood of human or non-human origin. There were many workers worthy of mention who were responsible for the many investigations which made possible the precipitin test for medico-legal purposes. The German scientist, Uhlenhuth, however, must be credited with the distinction of having been the first to present a review of the value of this test and its possibilities in legal medicine, his work having been published in 1901. This serological or biological method was employed at a trial for murder for the first time in 1902 in France. Eight years later evidence based upon the results of this test was employed in an important criminal case in Great Britain. Since then this technique has been used extensively for the examination of incriminating blood stains and has been accepted in the courts of most civilized countries as a valuable aid for obtaining evidence as to the source of a blood stain.

When animals are injected with bacteria or with solutions of albuminous substances of animal or vegetable origin, there develops in the blood (and mainly in the blood serum, the liquid portion of

the blood) specific protective substances or antibodies. Among the latter are to be found frequently precipitins, so named because they possess the power of producing a precipitate, when the clear blood serum of the inoculated or immunized animal possessing them is mixed with a clear solution (extract) of the specific albuminous substance or culture filtrate which was employed in injecting the animal (in other words was responsible for the production of the specific precipitins). Precipitins (present in the blood serum of animals) can be produced which will be specific in their effects for any kind of albuminous material. The medical jurist takes advantage of this fact by injecting an animal, usually a rabbit with the blood or blood serum of an unrelated animal. Antibodies will be produced in the treated or immunized rabbit's blood so that the serum from the latter (frequently spoken of as an antiserum) will produce a precipitate when mixed with the blood serum of the unrelated animal whose blood or blood serum was employed in the injections. If human blood or blood serum was employed in the process of immunization, then the rabbit's serum would contain precipitins which would produce a precipitate with human blood serum only. Normal rabbit serum does not possess this power and will not produce a precipitate in the previous experiment if it should be employed to replace the immunized rabbit's blood serum. The production of a precipitate in the test is observed practically by an increasing development of a haze or cloudiness in the mixture followed by the formation of a precipitate.

Anti-human precipitins or anti-serum containing precipitins specific for human blood cells are prepared in practice by injecting rabbits with small amounts of human blood deprived of the clotting material, fibrin (so-called defibrinated blood), or human blood serum is used (the latter being the liquid portion of the blood deprived of the cellular elements or solid portion). Depending upon the technique employed, the number of injections, the dosage which increases in each injection, and the interval of time elapsing between each injection, will vary. The injections are continued until trial tests of the rabbit's blood reveal the presence of a high content of anti-human precipitins. When the latter is found to be present the animals are bled under aseptic conditions. The clear serum is obtained, placed in sterile vials and kept in the refrigerator until needed.

In applying the test to suspicious stains, the first procedure is to make an extract of the latter. For this purpose a weak salt solution (0.85 per cent. salt) has been found as the best solvent. The extract thus obtained is neutralized with acid or alkali as the case may be and filtered or centrifugalized if necessary so as to ensure an absolutely clear and neutral solution. Suitable dilutions of the latter are then mixed in appropriate proportions with the clear serum of a rabbit which has been properly immunized against human blood or blood serum and which anti-serum has been found to be potent. The addition of this anti-serum to the extract will cause the production of a haze in the weaker dilutions which progressively increases and becomes dense in the more concentrated mixtures if human blood serum is present in the suspicious blood stain. In medico-legal procedures, a positive reaction should appear within twenty minutes while the mixtures are kept at room temperature. In carrying out this technique, numerous controls are used. Into a series of identical tubes there are placed the same mixtures as in the test proper, but the clear extract of the suspicious stain is replaced by the following, each in different tubes: An extract of the material but which is unstained; dilutions of human blood serum; and dilutions of blood serum of one or more animals other than human. The results of the precipitin test can only be regarded as complete and reliable providing rigid control tests have been made carefully. Under the ordinary conditions of this test as performed routinely, attempts are made to distinguish only between human and non-human blood serum. A positive reaction under such conditions indicates that human blood serum proteins are present. This coupled with positive findings for the presence of hemoglobin makes it possible for a medical jurist to say with assurance and to testify that the suspicious stain was caused by human blood. Only in few specific instances are attempts made to determine the particular animal blood present if after obtaining positive evidence for blood, the precipitin test reveals that it is not that of a human being. This means performing a precipitin test but instead of employing anti-serum specific for human blood serum, anti-serum specific for dog or cow or the blood of the animal in question is employed. Here however we are more likely to encounter the problem of obtaining group reactions. Thus dog and fox blood give a similar reaction and they are classed together as "canine blood." Cow and ox blood are grouped together

as "bovine"; sheep and goat blood are classed as "ovine" and the blood from all birds are grouped under the designation of "avian blood."

The precipitin test is an extremely delicate and valuable method for the detection of the presence or absence of human blood-serum proteins. This test in itself cannot distinguish between the bloods of different sexes or of different individuals or races.

Individuality of Human Blood

We have determined by chemical, spectroscopic and microscopic methods that blood is present on material containing suspicious stains. A generic diagnosis is thus made. By the aid of a microscopical examination we may have been able to establish the fact that we are dealing with mammalian or non-mammalian blood. But if the former is present or microscopy was unable to offer any aid, the precipitin test must be called upon for a specific diagnosis so that we may be able to definitely determine whether the blood is from a human being. In many of the medico-legal investigations, the scientific expert's testimony is finished at this point for all that is needed in the chain of evidence is proof that the suspicious stains are or are not due to human blood.

There are times, however, especially when dealing with minute stains, the question is raised as to the individuality of the human blood found in the stains. "Yes, that probably is my blood on that sleeve. I cut my hand and some of the blood stained my coat," or "Perhaps it is human blood but it's not mine" are answers given by defendants. It is such investigations involving a diagnosis of individuality which though exceptional become of great importance in certain medico-legal cases when they present themselves. An individual medico-legal diagnosis of blood stains is frequently possible, and this procedure though it has many limitations has rendered important services to justice especially in European countries, where it has been used more frequently. We have to deal with extremely delicate investigations in the individual diagnosis of blood stains and individuality tests should only be performed by those experienced in the technique of these reactions.

After a specific diagnosis has been made, that is human blood is found, the Landsteiner and Richter's reaction is performed as the first step in a diagnosis of individuality. Blood is obtained from the suspected person and the corpuscles are removed. The fresh corpuscles are tested against a saline extract of the suspicious stain.

The presence or absence of agglutination or clumping of those red cells from the suspected person (as observed microscopically) is employed as an aid to warrant the exclusion or to regard with suspicion the person in question. In either case the next procedure is an attempt to determine the specific type to which the blood in the different stains belongs.

The existence of four blood groups as a fixed and constitutional individual human characteristic is now definitely established and accepted as such by most scientists. The determinations of the blood groups of donors (those who give blood in transfusions) and the recipient (the one receiving the blood) are daily routine procedures today in medical and surgical practice. Here, however, fresh blood is available. Even in paternity suits scientific jurists regard blood group investigations as affording evidence for the proof of filiation. Its value, however, for the determination of paternity lies in the fact that although it cannot be said that by this test any man can be proven definitely as the father, it is frequently possible to assert that a certain man *is not* the father or that he *might* be the father. In medico-legal cases, where fresh blood is available as in paternity cases, the technique to be used in arriving at a diagnosis is not as intricate as in the case when stains, especially when dry, old and altered, are to be examined to determine the specific group of the human blood present. It is on this account that the use of blood grouping techniques in the examination of human blood stains has many limitations. Here also it must be remembered that the test when carried out may be of more value in eliminating certain persons rather than incriminating any particular individual.

From the point of view of justice where the identification of blood is to be an important issue in a criminal case or in fact in any crime involving bloodshed, a most praiseworthy proposal is obtaining the victim's blood at the post-mortem examination with a view of immediate typing and for other possible future investigations. This should be a routine procedure as is practiced in some European countries, and from a criminological standpoint this practice is frequently found to be of great value in later investigations.

Conclusions

Wherever possible in the examination of stains for blood in medico-legal cases all of the previously mentioned tests should be

carried out in their entirety. However, in many cases this is not possible. The technique to be used on account of the minute amounts of material available must necessarily be modified at times, but they should include at least the preliminary and most of the important confirmatory tests herein outlined.

Man's close scrutiny has as yet been unable to disclose all of the many elements present in blood. Some of them still undiscovered and concerned in its action are perhaps important factors in the whole story of life. If and when these hidden mysteries will be disclosed to man, it is possible that there may be presented data which will make available more exacting scientific tests for the identification of blood and for the differentiation of the different kinds of blood.

COSMETIC COLD CREAMS

By Peter P. Ramanuskas, B. Sc.

COSMETIC creams whose chief function is merely to preserve the mellowness and suppleness of the skin are of necessity made of substances which are oily or fatty in character.

The practice of applying oily or greasy substances to the skin can be traced to earliest antiquity. That the Egyptians anointed their bodies with oils scented with balsams and resins, is mentioned in the most ancient records. The oils and fats used then were of vegetable or animal origin. Mineral oil which is a common ingredient in our modern creams and which is so often subjected to condemnation was not known in a state of purity.

Official "Ointment of Rose Water" is a genuine example of a "true" cold cream and its classical prototype is referred to in the medieval pharmacopœias as "Unguentum" or "Ceratum Refrigerans, Galeni." It is said to have originated with Galen himself. Although "Cold" cream is not now recognized as an official synonym, a large number of similar products of varying composition are popularly exploited by that name. Modifications of ordinary cold cream have led to the development of numerous cosmetic creams having diverse names and uses.

The unreconcilable differences of opinion, respecting the merits of many substances now used in the manufacture of cold creams, make it impossible to formulate a product which would be exempt from criticism. The formulas submitted below, therefore, should not be considered as "ideal," but merely as examples of cold creams in which are utilized some of the products of modern scientific development.

There are so many factors that have a direct influence upon the consistency and texture of the finished product it may be found necessary to modify the formulas somewhat to satisfy individual requirements. Proper control and selection of raw materials and sometimes the addition of a preservative are essential to ensure adequate stability. This is especially true when vegetable or animal oils are used in place of the mineral oil.

The selection of perfume should receive special consideration. Perfumes that have a tendency to discolor the cream or have irritating or rubefacient properties must be avoided. A cream having a characteristic odor can readily be made, without too extensive experi-

menting, by blending two or more perfume odors especially prepared for creams by reputable perfume manufacturers. On account of the volatility of perfumes, they should be incorporated into the cream at the lowest possible temperature compatible with efficient manufacture.

Formula No. 1 has the same ingredients as official "Ointment of Rose Water" with the exceptions that distilled water is used in place of stronger rose water, and the addition of perfume. The proportions of the various ingredients, however, are altered to produce a product more suitable for cosmetic purposes.

FORMULA NO. 1.

	Percentage by Weight
Spermaceti	9.5
White Beeswax	10.5
Expressed Oil of Almond	56.0
Sodium Borate	2.5
Distilled Water	21.5
Perfume q. s.	

Dissolve the sodium borate in hot water. Melt the spermaceti and white beeswax together on a water bath. Add the expressed oil of almond and stir until the mixture is uniform, keeping the temperature at 75° C. Gradually pour in the sodium borate solution, heated to the same temperature, stirring rapidly and continuously, without heat, until the temperature drops to 45° C. Add the perfume and stir slowly until the cream becomes of uniform consistence.

Formula No. 2. Peach kernel oil is used in place of expressed oil of almond. It is less expensive than almond oil and produces a more stable cream. The addition of cetyl alcohol also improves the texture of the cream.

FORMULA NO. 2.

	Percentage by Weight
Cetyl Alcohol	2
Spermaceti	8
White Beeswax	10
Peach Kernel Oil	55
Sodium Borate	2
Distilled Water	23
Perfume q. s.	

Melt the cetyl alcohol, spermaceti and white beeswax together and proceed as in Formula No. 1.

Formula No. 3. A mineral oil type of cold cream. Although not as elegant as the above creams, it has excellent keeping qualities.

FORMULA No. 3.

	Percentage by Weight
Cetyl Alcohol	3
Spermaceti	9
White Beeswax	14
Heavy Mineral Oil	55
Sodium Borate	1
Distilled Water	18
Perfume q. s.	

Melt the cetyl alcohol, spermaceti and white beeswax together on a water bath. Add the heavy mineral oil and proceed as in Formula No. 1.

Formula No. 4. Triethanolamine is used as the emulsifying agent. This type of cream has a tendency to darken with age but has one advantage over the above creams, in that it can be readily removed from the skin with water.

FORMULA No. 4.

	Percentage by Weight
Stearic Acid	13
White Beeswax	5
Petrolatum (White)	3
Anhydrous Lanolin	3
Heavy Mineral Oil	29
Triethanolamine	2
Ethyl Ether of Diethylene Glycol	5
Distilled Water	40
Perfume q. s.	

Melt the stearic acid, white beeswax, petrolatum and anhydrous lanolin together on a water bath. Add the heavy mineral oil and stir until the mixture is uniform, keeping the temperature at 80° C. Mix the triethanolamine with the water and heat to 95° C. Pour the melted fats and oil into the triethanolamine solution. Stir rapidly,

without heat, until an emulsion forms and the temperature drops to 60° C. Add the ethyl ether of diethylene glycol and stir until the temperature drops to 50° C. Add the perfume and stir slowly until the cream becomes of uniform consistence.

Formula No. 5. A non-alkaline type of cold cream that does not discolor with age.

FORMULA No. 5.

	Percentage by Weight
Diglycol Stearate	12.5
White Petrolatum	10.0
Paraffin Wax	6.0
Heavy Mineral Oil	16.0
Ethyl Ether of Diethylene Glycol	2.5
Distilled Water	53.0
Perfume q. s.	

Melt the diglycol stearate, white petrolatum and paraffin wax together on a water bath. Add the heavy mineral oil and stir until the mixture is uniform, keeping the temperature at 80° C. Then slowly, while stirring, add the water which has been heated to the same temperature. Continue stirring without heat until the temperature drops to 60° C. Add the ethyl ether of diethylene glycol and stir until the temperature drops to 50° C. Add the perfume and stir slowly until the cream becomes of uniform consistence. Aeration due to vigorous stirring should be avoided.

THE LEAF OILS OF WASHINGTON CONIFERS: ABIES GRANDIS *[1]

By Charles Schwartz, Jr.

ABIES grandis Lindley, appropriately called "grand fir," is a tree rather widely distributed in Washington. When growing under favorable conditions, a height of from 150 to 200 feet is attained. It thrives best at low elevations under moist conditions, and consequently is found most abundantly in the coastal regions on stream bottoms and their bordering valleys, and on lower gentle mountain slopes. Pure stands of the tree are rare, admixture with Douglas fir being common.

The volatile oil was obtained from leaves and twigs collected in October, 1933, from young trees growing in the mountains of western Washington. From 190 pounds of fresh material there was obtained by steam distillation 600 cc. of volatile oil, which corresponded to a yield of 0.62 per cent.

The oil possessed a pale greenish-yellow color and a rather sickening, pungent odor. It was readily soluble in 95 per cent. alcohol. The constants were determined and found to be as follows: d_{20}^{20} 0.8983; n_D^{20} 1.4710; $[\alpha]_D^{23}$—43.78; saponification number 82.79; acid number 0.79; ester number 82.0; per cent. of ester, calculated as bornyl acetate 28.70; saponification number after acetylization 99.80; per cent. of total alcohol, calculated as borneol 27.51; per cent. of free alcohol, calculated as borneol 4.96.

Phenols: The oil was washed with 5 per cent. sodium carbonate solution to remove the small amount of free acid present, and was then extracted repeatedly with a 5 per cent. sodium hydroxide solution. The phenolic extract thus obtained was shaken out with ether. Since the latter ethereal solution might contain carvacrol in addition to adhering oil, it was dried over anhydrous sodium sulphate and allowed to evaporate spontaneously A very small amount of oily residue was obtained which did not respond to the color test for

*This paper is part of a thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy, and is the second of a series of three papers on the Leaf Oils of Washington Conifers.

1. Work done under the direction of Dr. Russell A. Cain, Instructor in Pharmacy, College of Pharmacy, University of Washington.

carvacrol with ferric chloride solution. The aqueous liquid was then acidified with dilute sulphuric acid and extracted as before with ether. Again a small amount of oily residue was obtained which was viscous, brownish, and practically odorless. Dilute ferric chloride colored an alcoholic solution of the residue a deep purple. Although this would indicate a trace of phenols in the original oil, the amount here obtained was insufficient for further identification.

Fractionation: The residual oil was washed with water until free of alkalinity and dried over anhydrous sodium sulphate, after which it was distilled several times up to 85° C. at 7 mm. pressure. The distillate obtained was again distilled to the same temperature at 7 mm. The combined residues and final distillate represented 46.75 and 48.00 per cent. by volume, respectively, of the original oil.

The lower boiling portion was fractionated and refractionated several times at atmospheric pressure using a 15 cm. fractionating column. The following fractions were finally obtained:

Fraction	Temp. range	Volume	Per cent. by volume of original oil	Rotation
I	150-160°C.	56 cc.	14.00	levo
II	160-163°C.	95.5	23.87	levo
III	163-168°C.	23.5	5.87	levo
IV	168-180°C.	9.5	2.37	levo

Levo Alpha Pinene: A nitrosochloride was prepared from fraction I according to Wallach's method (1). After purification by precipitation from chloroformic solution with methyl alcohol, the product melted at 104° C., and showed no depression of melting point when mixed with pure alpha pinene nitrosochloride prepared from turpentine oil. A second portion of the fraction was oxidized with potassium permanganate as directed by Tiemann and Semmler (2), resulting in the production of a brownish, viscous residue which yielded a semicarbazone melting at 203° C. This identified pinonic acid, the oxidation product of alpha pinene.

Levo Camphene: The second and largest fraction was hydrated by means of acetic and sulphuric acids according to the directions of Bertram and Walbaum (3). The washed and dried product resulting from this hydration was fractionally distilled, whereupon a solid

with a borneol-like odor collected in the condenser between 200 and 206° C. A portion of the solid, when mixed with phenylisocyanate, yielded a phenylurethane having a melting point of 138° C. The melting point of the solid, together with that of the phenylurethane prepared from it, served to identify iso-borneol, the alcohol obtained by hydrating camphene.

Levo Beta Pinene: Fraction III was oxidized with alkaline potassium permanganate solution as directed by Wallach (4). As a result of this oxidation, a copious mass of flat, shiny crystals was obtained. After filtering and washing well with cold water, the crystals were taken up with dilute sulphuric acid and the mixture extracted with ether. The ethereal solution was dried, and upon evaporation of the solvent, there remained white, needle-shaped crystals of nopinic acid, which, after purification with benzene, melted sharply at 126° C. There was no depression of the melting point when the crystals were mixed with pure nopinic acid. The identification of nopinic acid served to identify the presence of beta pinene.

Levo Beta Phellandrene: A nitrite prepared from the fourth fraction melted at 102° C. after purification by repeated precipitation from chloroformic solution with methyl alcohol. This fraction consisted, therefore, of beta phellandrene.

Saponification and Fractionation: That portion of the oil which boiled above 85° C. at 7 mm. pressure was saponified by heating with an alcoholic solution of potassium hydroxide. After distilling off the alcohol, the saponified oil was washed with water until free of alkalinity. The aqueous washings were combined and shaken out with ether in order to remove adhering oil. The remaining oil, to which the ether solution was added, was dried in the usual way, heated on a water bath until the ether was entirely volatilized, and then fractionated under ordinary pressure. The following fractions were obtained:

Fraction	Temp. range	Volume	Per cent. by volume of original oil
I	180-185°C.	4 cc.	1.00
II	185-195°C.	7.5	1.87
III	195-230°C.	Solid	....
IV	Residue	10	2.50

Borneol: Fractions I and II, which amounted to a total of 11.5 cc., although liquids at ordinary temperature, solidified almost completely on cooling. Fraction III solidified in the condenser during the process of distillation. All three solid materials were decidedly like camphor as to physical properties, and melted at 202° C. after recrystallization from ether, indicating them to be the alcohol, borneol. A phenylurethane melting at 139° C. after purification with benzene was prepared from each. Admixture of the phenylurethanes with pure borneol phenylurethane caused no depression of the melting point, definitely confirming the identity as borneol.

Fraction IV: This fraction, which consisted of the residue remaining in the flask, was a dark brown, viscous liquid boiling above 230° C. and possessing an empyreumatic odor. Since it might contain sesquiterpenes, an attempt was made to prepare a hydrochloride. Dry hydrogen chloride gas was passed into an ethereal solution of the fraction in the same manner as outlined in our previous paper. No solid hydrochloride could be obtained.

Free Acids: No attempt was made to isolate and identify the free acids since the acid number of the oil indicated that only a small amount was present.

Combined Acids: Acidification and steam distillation of the aqueous potassium hydroxide extract containing the combined acids produced a cloudy distillate possessing a sharp, rancid odor. The distillate was neutralized with sodium carbonate solution and evaporated to dryness. The residue obtained responded to various qualitative tests for acetic acid. The odor of the distillate also suggested the presence of traces of other volatile fatty acids, such as butyric and valeric.

Summary: The leaves and twigs of Abies grandis yielded by steam distillation 0.62 per cent. of a volatile oil, the general constants of which were determined. Analysis showed the oil to be composed of the following constituents, approximately in the percentages

stated: esters of borneol, chiefly bornyl acetate, 28.7; l-camphene, 23.87; l-α-pinene, 14.0; l-β-pinene, 5.87; free borneol, 4.96; high boiling residue, 2.5; l-β-phellandrene, 2.37 per cent.; also traces of free acids and phenols. No evidence of the presence of sesquiterpenes could be obtained.

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Thetal*

(Hartman's Dental Analgesic)

*This name, coined by joining the first two letters of each ingredient, is suggested as a handy designation.

Thymol	50 gm.
Ether	54 cc.
Alcohol (95%)	122 cc.

Such is the workable formula for the new local pain-killing fluid recently announced by Prof. Leroy L. Hartman, professor of dentistry in the Columbia University School of Dental and Oral Surgery. The new pain-killer is applied to the dentin of a tooth, lying just below the enamel, and makes possible the drilling of a cavity without feeling on the part of the patient.

Here is the formula exactly as Professor Hartman disclosed it before 3000 of his fellow dentists at a joint meeting of the First and Second District Dental Societies of the State of New York:

Thymol	1¼ parts by weight
Ethyl alcohol	1 part " "
Sulphuric ether	2 parts " "

The solution is kept in a brown bottle and applied directly to the dentin with a moistened pellet of cotton. The pain-killing effects last one hour if the cavity is kept dry by the use of a rubber dental dam. If saliva dilutes the solution the effect may last only twenty minutes. But because the local anesthetic is designed to kill pain only during drilling, the time is ample.

A dental specialist recently communicated to the editor the fact that the replacement of thymol with equal parts of menthol and phenol crystals gave still better results.

Compiled by Prof. Geo. W. Muhleman
Hamline University

The Chemical Elements and Their Discoverers†

† Reprinted from "The La
Fisher Scientific Company,

Name	Isotopes	At. No.	Valence	At. Wt.	Discoverer and Nationality	Year
Actinium (Ac)		89	3	228	Debierne (F)	1899
Alabamine		85	8		Allison, Murphy (A)	1931
Aluminum (Al)	1	13	3	26.97	Wohler (G)	1827
Antimony (Sb) (*Stibnium*)	2	51	3–5	121.76	Tholde (G)	1450
Argon (A)	2	18	0–8	39.944	Raleigh, Ramsay (E)	1894
Arsenic (As)	1	33	3–5	74.91	Albertus Magnus (R)	1250
Barium (Ba)	4	56	2	137.36	Davy (E)	1808
Beryllium (Be) (*Glucinum*)	2	4	2	9.02	Vauquelin (F)	1798
Bismuth (Bi)	2	83	3–5	209.00	Geoffroy (E)	1753
Boron (B)	2	5	3	10.82	Davy (E), Gay-Lussac (F) Thenard (F)	1808
Bromine (Br)	2	35	1–7	79.916	Balard (F)	1826
Cadmium (Cd)	6	48	2	112.41	Stromeyer (G)	1817
Calcium (Ca)	2	20	2	40.08	Davy (E), Berzelius (S), Pontin (F)	1808
Carbon (C)	2	6	2–4	12.000	Ancient	B.C.
Cerium (Ce)	2	58	3–4	140.13	Klaproth (G), Hissinger, Berzelius (S)	1803
Cesium (Cs)	1	55	1	132.91	Bunsen, Kirchoff (G)	1860
Chlorine (Cl)	2	17	1–7	35.457	Scheele (S)	1774
Chromium (Cr)	4	24	2–3–6	52.01	Vauquelin (F)	1798
Cobalt (Co)	1	27	2–3	58.94	Brandt (S)	1735
Columbium (Cb) (*Niobium*)		41	3–5	92.91	Hatchett (E)	1801
Copper (Cu) (*Cuprum*)	2	29	1–2	63.57	Ancient	B.C.
Dyprosium (Dy)		66	3	162.46	Boisbaudran (F)	1886
Erbium (Er)		68	3	167.64	Mosander (S)	1843
Europium (Eu)		63	3	152.00	Demarcay (F)	1901
Fluorine (F)	1	9	1–7	19.00	Scheele (S)	1771
Gadolium (Gd)		64	3	157.30	Marignac (F)	1880
Gallium (Ga) (*Gallia*)	2	31	3	69.72	Boisbaudran (F)	1875
Germanium (Ge) (*Germania*)	8	32	4	72.60	Winkler (G)	1886
Gold (Au) (*Aurum*)		79	1–3	197.2	Ancient	B.C.
Hafnium (Hf) (*Hafnia, Copenhagen*)		72	4	178.6	Coster (D), Hevesy (H)	1923
Helium (He) (*Helios*)	1	2	0–8	4.002	Janssen (F), Lockyer (E) Ramsay (E), Cleve (S)	1868 1895
Holmium (Ho) (*Holmia, Stockholm*)		67	3	163.5	Cleve (S)	1879
Hydrogen (H) (*Gr. Hydro*)	2	1	1	1.0078	Cavendish (E)	1766
Illinium (Il)		61	8–0		Hopkins, Harris (A), Yntema, (Hindu)	1926
Indium (In)	1	49	3	114.76	Reich, Richter (G)	1863
Iodine (I) (*Iodes*)	1	53	1–7	126.932	Courtois (F)	1811
Iridium (Ir) (*Iris, Rainbow*)		77	3–4	193.1	Tennant (E)	1804
Iron (Fe) (*Ferrum*)	2	26	2–3	55.84	Ancient	B.C.
Krypton (Kr) (*Gr. Kryptos, hidden*)	6	36	0–8	83.7	Ramsay, Travers (E)	1898
Lanthanum (La) (*Gr. Lanthano, to conceal*)	1	57	3	138.90	Mosander (S)	1839
Lead (Pb) (*Plumbum*)	8	82	2–4	207.22	Ancient	B.C.
Lithium (Li) (*Lithos, stone*)	2	3	1	6.940	Arfvedson (S)	1817
Lutecium (Lu) (*Lutetia, Paris*)		71	3	175.20	Urbain (F)	1907
Magnesium (Mg.) (*Magnesia, in Thessaly*)	3	12	2	24.32	Davy (E)	1808
Manganese (Mn) (*Magnes, magnet*)	1	25	2–4–6–7	54.93	Gahn (S)	1774
Masurium (Ms) (*Masurian, in Germany*)		43	7	96 (?)	Noddack, Tacke, Berg (G)	1924
Mercury (Hg) (*Hydrargyrum*)	7	80	1–2	200.61	Ancient	B.C.
Molybdenum (Mo) (*Gr. Molybdos, lead*)	7	42	3–4–6	96.0	Hjelm (S)	1781
Neodymium (Nd) (*Gr. Neos, New; Didymos, Twin*)	4	60	3	144.27	Welsbach (G)	1885
Neon (Ne) (*Gr. Neos, New*)	3	10	0–8	20.183	Ramsay, Travers (E	
Nickel (Ni)	3	28	2–3	58.69	Cronstedt (S)	
Nitrogen (N)	2	7	3–5	14.008	Rutherford (E)	
Osmium (Os) (*Gr. Osme, Color*)	6	76	2–3–4–8	191.5	Tennant (E)	
Oxygen (O)	3	8	2	16	Priestley (E)	
Palladium (Pd) (*Planet, Pallus*)		46	2–4	106.7	Wollaston (E)	
Phosphorus (P) (*Gr. Light Bearer*)	1	15	3–5	31.02	Brand (G)	
Platinum (Pt) (*Sp. platina*)		78	2–4	195.23	Wood (E)	
Polonium (Po)		84	6		Marie and Pierre Cu	
Potassium (K) (*Kalium*)	2	19	1	39.10	Davy (E)	
Praseodymium (Pr) (*Gr. praseos, Green; didymos, Twin*)	1	59	3	140.92	Welsbach (G)	
Protoactinium (Pa)		91	5		Soddy, Cranston (E) Hahn, Meitner (G	
Radium (Ra) (*Radius, ray*)	4	88	2	225.97	Marie and Pierre Cu	
Radon (Rn) (*Niton*)		86	0–8	222.00	Dorn (G)	
Rhenium (Re) (*Rhine prov.*)	2	75	7	186.31	Noddack, Tacke, Ber	
Rhodium (Rh) (*Gr. Rhodon, rose*)		45	3	102.91	Wollaston (E)	
Rubidium (Rb) (*Rubidus, red*)	2	37	1	85.44	Bunsen, Kirchoff (G	
Ruthenium (Ru) (*Ruthenia, Russia*)	7	44	3–4–6–8	101.7	Klaus (Ru)	
Samarium (Sm) (*Samarski, a Russian*)		62	3	150.43	Boisbaudran (F)	
Scandium (Sc) (*Scandinavia*)	1	21	3	45.10	Nilson (S)	
Selenium (Se) (*Gr. selene, moon*)	6	34	2–4–6	78.96	Berzelius (S)	
Silicon (Si) (*Silex, flint*)	3	14	4	28.06	Berzelius (S)	
Silver (Ag) (*Argentum*)	2	47	1	107.880	Ancient	
Sodium (Na) (*Natrium*)	1	11	1	22.997	Davy (E)	
Strontium (Sr) (*Strontian, in Scotland*)	3	38	2	87.63	Crawford, 1790, Dav	
Sulfur (S)	3	16	2–4–6	32.06	Ancient	
Super-Uranium		93			Fermi (I)	
Tantalum (Ta)		73	5	181.4	Ekeberg (S)	
Tellurium (Te) (*Tellus, earth*)	4	52	2–4–6	127.61	Reichenstein (Au)	
Terbium (Tb) (*Ytterby, in Sweden*)		65	3	159.2	Mosander (S)	
Thallium (Tl) (*Thallus, budding twig*)	3	81	1–3	204.39	Crookes (E)	
Thorium (Th) (*God, Thor*)	8	90	4	232.12	Berzelius (S)	
Thulium (Tm) (*Thule, Northland*)		69	3	169.4	Cleve (S)	
Tin (Sn) (*Stannum*)	11	50	2–4	118.70	Ancient	
Titanium (Ti) (*Titanes, sons of earth*)	1	22	3–4	47.90	Gregor (E)	
Tungsten (W) (*Wolframium, heavy stone*)	4	74	6	184.0	d'Elhuyar Brothers	
Uranium (U) (*Planet Uranus*)	8	92	4–6	238.14	Klaproth (G)	
Vanadium (V) (*Goddess, Vanadis*)	1	23	3–5	50.95	Sefstrom (S)	
Virginium		87	1		Allison, Murphy (A	
Xenon (Xe) (*Gr. Xenos, strange*)	9	65	0–8	131.3	Ramsay, Travers (E	
Ytterbium (Yb) (*Ytterby, in Sweden*)	1	70	3	173.04	Marignac (F)	
Yttrium (Y) (*Ytterby, in Sweden*)	1	39	3	88.92	Gadolin (Fi)	
Zinc (Zn)	5	30	2	65.38	Marggraf (G)	
Zirconium (Zr)	3	40	4	91.22	Klaproth (G)	

(A)—American (Au)—Austrian (D)—Dutch (E)—English (F)—French (Fi)—Finnish (G)—German (H)—Hungarian (I)—Italian (R)—Roman (Ru)—Russian (S)—Swedish (Sp)—Spanish

s and Their Discoverers†

† Reprinted from "The Laboratory" Fisher Scientific Company, Pittsburgh, Pa.

Name	Isotopes	At. No.	Valence	At. Wt.	Discoverer and Nationality	Year
Neon (Ne) (*Gr. Neos, New*)	3	10	0–8	20.183	Ramsay, Travers (E)	1898
Nickel (Ni)	3	28	2–3	58.69	Cronstedt (S)	1754
Nitrogen (N)	2	7	3–5	14.008	Rutherford (E)	1772
Osmium (Os) (*Gr. Osme, Color*)	6	76	2–3–4–8	191.5	Tennant (E)	1804
Oxygen (O)	3	8	2	16	Priestley (E)	1774
Palladium (Pd) (*Planet, Pallus*)		46	2–4	106.7	Wollaston (E)	1803
Phosphorus (P) (*Gr. Light Bearer*)	1	15	3–5	31.02	Brand (G)	1669
Platinum (Pt) (*Sp. platina*)		78	2–4	195.23	Wood (E)	1741
Polonium (Po)		84	6		Marie and Pierre Curie (F)	1898
Potassium (K) (*Kalium*)	2	19	1	39.10	Davy (E)	1807
Praseodymium (Pr) (*Gr. praseos, Green; didymos, Twin*)	1	59	3	140.92	Welsbach (G)	1885
Protoactinium (Pa)		91	5		Soddy, Cranston (E), Hahn, Meitner (G)	1917
Radium (Ra) (*Radius, ray*)	4	88	2	225.97	Marie and Pierre Curie (F)	1898
Radon (Rn) (*Niton*)		86	0–8	222.00	Dorn (G)	1900
Rhenium (Re) (*Rhine prov.*)	2	75	7	186.31	Noddack, Tacke, Berg (G)	1924
Rhodium (Rh) (*Gr. Rhodon, rose*)		45	3	102.91	Wollaston (E)	1803
Rubidium (Rb) (*Rubidus, red*)	2	37	1	85.44	Bunsen, Kirchoff (G)	1861
Ruthenium (Ru) (*Ruthenia, Russia*)	7	44	3–4–6–8	101.7	Klaus (Ru)	1844
Samarium (Sm) (*Samarski, a Russian*)		62	3	150.43	Boisbaudran (F)	1879
Scandium (Sc) (*Scandinavia*)	1	21	3	45.10	Nilson (S)	1879
Selenium (Se) (*Gr. selene, moon*)	6	34	2–4–6	78.96	Berzelius (S)	1818
Silicon (Si) (*Silex, flint*)	3	14	4	28.06	Berzelius (S)	1823
Silver (Ag) (*Argentum*)	2	47	1	107.880	Ancient	B.C.
Sodium (Na) (*Natrium*)	1	11	1	22.997	Davy (E)	1807
Strontium (Sr) (*Strontian, in Scotland*)	3	38	2	87.63	Crawford, 1790, Davy (E)	1808
Sulfur (S)	3	16	2–4–6	32.06	Ancient	B.C.
Super-Uranium		93			Fermi (I)	1934
Tantalum (Ta)		73	5	181.4	Ekeberg (S)	1802
Tellurium (Te) (*Tellus, earth*)	4	52	2–4–6	127.61	Reichenstein (Au)	1782
Terbium (Tb) (*Ytterby, in Sweden*)		65	3	159.2	Mosander (S)	1843
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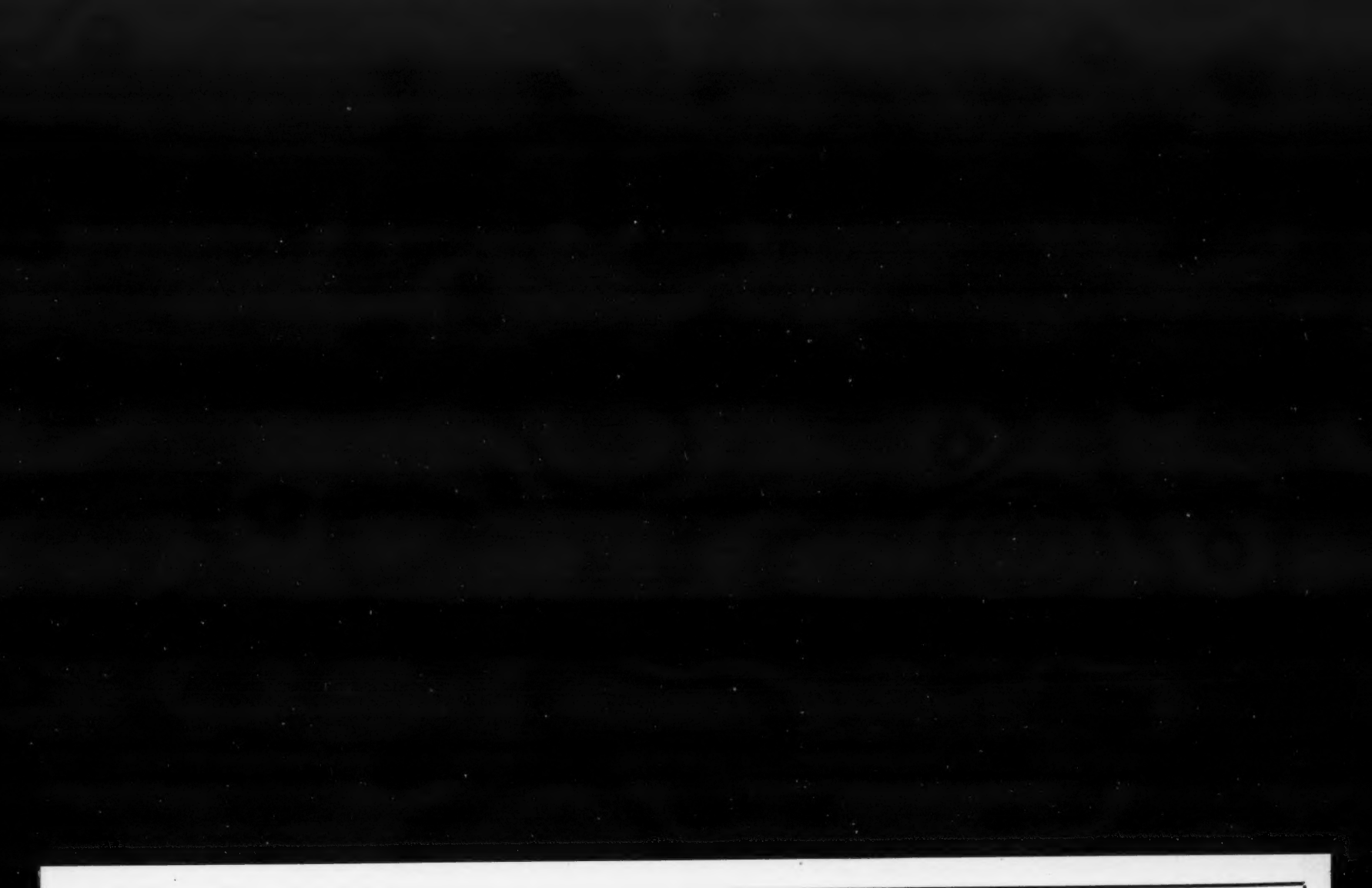
Tungsten (W) (*Wolframium, heavy stone*)	4	74	6	184.0	d'Elhuyar Brothers (Sp)	1783
Uranium (U) (*Planet Uranus*)	8	92	4–6	238.14	Klaproth (G)	1789
Vanadium (V) (*Goddess, Vanadis*)	1	23	3–5	50.95	Sefstrom (S)	1830
Virginium		87	1		Allison, Murphy (A)	1930
Xenon (Xe) (*Gr. Xenos, strange*)	9	65	0–8	131.3	Ramsay, Travers (E)	1898
Ytterbium (Yb) (*Ytterby, in Sweden*)	1	70	3	173.04	Marignac (F)	1878
Yttrium (Y) (*Ytterby, in Sweden*)	1	39	3	88.92	Gadolin (Fi)	1794
Zinc (Zn)	5	30	2	65.38	Marggraf (G)	1746
Zirconium (Zr)	3	40	4	91.22	Klaproth (G)	1789

(H)—Hungarian (I)—Italian (R)—Roman (Ru)—Russian (S)—Swedish (Sp)—Spanish



SCIENTIFIC AND TECHNICAL ABSTRACTS

Compiled by Linwood F. Tice, M. Sc.

Notes on the Permanganate Method of Estimating Reduced Copper in the Determination of Reducing Sugars. H. R. Kraybill, W. J. Youden and J. T. Sullivan. *J. A. O. A. C. 19,* 125 (1936). In the determination of reducing sugars by the estimation of the amount of cuprous oxide formed by the sugar, various workers have claimed that for accurate results it is necessary to standardize the permanganate against the cuprous oxide produced by a known quantity of pure glucose. Thus it is claimed that oxalic acid, sodium oxalate and iron give too low results.

The authors found it possible to standardize the permanganate solution using either sodium oxalate or cuprous oxide with a very close agreement in results. Too high values were obtained with the cuprous oxide if extreme care was not taken to accomplish complete solution of the cuprous oxide in the ferric ammonium sulfate. When this particular point was carefully controlled no significant difference between the cuprous oxide and the sodium oxalate method was found.

Furthermore, if the permanganate is standardized accurately and then in the determination of reducing sugars the cuprous oxide is not completely dissolved too low a result will be obtained. As a final check, permanganate which was standardized with sodium oxalate was used in the estimation of cuprous oxide in the determination of reducing sugars. Then the copper in the final solution was determined electrolytically. The two values so obtained were found to be in very close agreement.

A Tungstic Acid Precipitation Method for the Extraction of Estrogenic Substance from Urine. S. C. Freed, I. A. Mirsky and S. Saskin. *J, Biol. Chem. 112,* 143 (1935). The estimation of small amounts of estrogenic substance in urine necessitates its extraction from relatively large volumes of fluid. This is generally accomplished by subjecting the urine to a continuous extraction

process with one of a number of fat solvents. The difficulties of this procedure are obvious. These authors present a method based on the observation that a closely related substance, cholesterol, can be removed quantitatively from the tungstic acid precipitate of normal or pathological urine. The method is as follows: To each liter of urine 50 cc. of 50 per cent. sodium tungstate are added. This mixture is then acidified with concentrated sulfuric acid to a pH of 2-3, Congo red paper being used as the indicator. To the acidified solution, 50 cc. of 3.3 n. sulfuric acid are slowly added and a heavy precipitate is formed. This is allowed to settle for thirty minutes and then centrifuged until the supernatant fluid is clear. The clear fluid is discarded and 100 cc. of a 3:1 alcohol-ether mixture added to the residue. The alcohol-ether mixture may then be heated gently until it begins to boil or it may be allowed to stand at room temperature for one hour. Extraction is complete by either procedure. The mixture is then centrifuged and the alcohol-ether extract decanted into a beaker. The residue is washed with another small quantity of the alcohol-ether mixture, centrifuged, and the extract added to the beaker. The combined extracts are evaporated to dryness and the residue extracted twice with 25 cc. portions of anhydrous ether. Four cc. of cottonseed oil are added to the ether extract and the mixture is heated gently until the ether is driven off, leaving the oil in which the estrogenic substance is dissolved.

A Historical Survey on the Development of Percolation. K. Feinstein. *Pharm. Acta Helv. 11,* 19 (1936). This article is abstracted because of the attention it should command from those interested in the development of the present-day process of percolation. A large number of diagrams are presented together with a bibliography illustrating the various modifications in extraction apparatus that have been recommended in the past. The contributions made by various nations are presented and finally the more recent processes of drug extraction are described.

Sodium Perborate in the Treatment of Vincent's Infection. W. G. Downs, Jr. *Dental Survey 12,* 50 (1936), through *Squibb*

Abstr. Bull. 9, 507 (1936). Seven hundred cases of Vincent's infection were treated by the author with the following conclusions: Approximately 90 per cent. of all cases respond to local treatment with a paste of sodium perborate in water or glycerin accompanied by the use of a mouth wash containing about 2 per cent. sodium perborate in water. The so-called burns and whitened tongue were observed, both with or without the use of sodium perborate, thus showing that the perborate is not the causative factor involved. The author concludes that sodium perborate is an excellent and safe oral hygienic agent for lay distribution.

The Treatment of Inflammatory Conditions of the Ears and the Nose with Lactic Acid Bacilli. Th. Hunermann. *Z. f. Laryngol., Rhinol., Otol.* 1935 Bd. 26, through *Pharm. Ber. 11,* 35 (1936). A lactic acid bacillus preparation "Antagosan" is described for use in the treatment of certain types of inflammatory infections. The action of the preparation is described as comparable to a "biological disinfectant" possessing no injurious properties in itself to the most sensitive tissues and yet by its growth it crowds out the etiologic organisms producing the infection. The method of employing this preparation is described together with a short report on several cases showing marked improvement following its use.

The Use of Hydrated Magnesium Trisilicate in the Treatment of Peptic Ulcer. N. Mutch. *Brit. Med. J. I,* 254, 3918 (1936). Synthetic magnesium trisilicate which has the formula $Mg_2Si_3O_8$ n H_2O is a tasteless white insoluble powder which behaves both as an antacid and an adsorbent. Its adsorbent powers are superior to those possessed by the basic bismuth salts, magnesia, aluminum hydroxide or prepared chalk. The action of magnesium trisilicate as an antacid is very prolonged, exerting a sustained control over gastric hyperacidity. A small amount of this mineral base may be used, *e. g.,* 5-21 gr. of the anhydrous salt at a time, and any excess which may be used, due to its insolubility, in water will be excreted. Another point of importance is the strong antipeptic power of the

salt. This prevents the destructive digestion of the ulcer base. The author reports a series of fifteen cases of chronic gastric ulcer that were very satisfactorily treated by this material.

The Detection of Bromate. I. M. Korenman. *Z. Anal. Chem. 103,* 269 (1935), through *Analyst 61,* 143 (1936). Two cc. of the of solution to be tested is treated with 1 cc. of 4 n. HCl and one to two drops of 0.015 per cent. methyl orange solution. If bromate is present a rapid bleaching of the color will result. The sensitivity is 14 γ of potassium bromate in 2 cc. of solution. Inasmuch as iodates, chlorates, persulfates, etc., decolorize methyl orange only in solutions acidified with strong acid, the above reaction may be used, for example, in the detection of bromate in potassium chlorate. In this case 0.1 gm. of the salt is dissolved in 10 cc. of water and 2 cc. of the solution are treated as described. If 0.1 per cent. of bromate is present the color is bleached in a few seconds. Nitrite at concentrations below 1-2000 acts much more slowly than bromate. When the detection of potassium bromate in bromide is desired 0.2 gm. of the salt is dissolved in 2 cc. of water, the solution acidified and tested as described. As little as 0.01 per cent. bromate produces rapid decolorization of the methyl orange.

The Determination of Cocaine Alkaloids in Mixtures with other Alkaloids and Local Anesthetics. J. R. Nicholls. Analyst *61,* 155 (1936). This method for the evaluation of cocaine is based on the relatively weak basic action which this alkaloid possesses. Sodium bicarbonate is added to a solution containing the cocaine salt, the free alkaloid although it does not precipitate may then be extracted with an immiscible solvent. Other alkaloids and local anesthetics which are stronger bases are only very slowly, if at all, extracted under such conditions; and if the immiscible solvent is petroleum ether few are extracted. In those few cases where alkaloids other than cocaine are extracted, the extract may be treated with potassium permanganate to decompose the interfering substances. This is possible inasmuch as cocaine in slightly acid solution is not appreciably

affected by permanganate while other alkaloids and local anesthetics are attacked. Such a treatment can often be applied directly to a sample but this may be tedious if much material has to be oxidized. For carrying out the oxidation, the extracted residue (or the original sample) should be dissolved in n/10 sulfuric acid, and 3 per cent. potassium permanganate in n/2 sulfuric acid added until an excess is indicated by the color. After the solution has been decolorized with oxalic acid and sodium bicarbonate added in excess, the cocaine may be extracted with petroleum ether. The manganese comes out of solution only slowly and does not interfere with the extraction if this is carried out immediately after the addition of the bicarbonate. Oxidation with permanganate can be hastened by keeping the solution in a water bath at 60° C. Working under these conditions 0.2 gm. of procaine gave no extractable matter whereas 0.052 gm. of cocaine hydrochloride yielded after one-half hour treatment 0.0455 gm. of cocaine base equivalent to 0.051 gm. of the hydrochloride.

Any other alkaloids or local anesthetics remaining in a solution from which cocaine has been extracted may be liberated by the addition of an excess of ammonia unless, of course, they have been oxidized by permanganate. The author further presents a method for the determination of true cocaine alkaloids in preparations derived from coca leaves and containing other associated substances.

Tanning and Sunburn—Sunburn Prophylaxis. Drug and Cosmetic Industry 38, 180 (1936). Sunburn and tanning are due to certain rays in sunlight falling in the range of 2900-3200 A. U. The upper limit is said to be the shortest wave length transmitted by ordinary window glass and the lower limit is the shortest wave length which can penetrate the earth's atmosphere to any appreciable extent. At high altitudes still shorter and more active rays find their way to the earth's surface thus explaining the seriousness of the so-called "glacier burns."

The physiology of sun tanning and sunburn is still subject to considerable speculation. One theory points to the role of the skin pigment melanin in this process. This melanin is produced and deposited in the skin by the action of light on tyrosine, a component of skin proteins. Histidine is indirectly responsible for erythema.

Thus a brunette may tan while the blond is burned because of different tyrosine-histidine ratios in the skin. On the other hand the blond skin containing less pigment to start with or being thinner, it may allow more of the active light to penetrate below the surface of the skin and produce burns.

Regardless of the theories advanced concerning the mechanism of tanning or sunburn, it seems quite definite that if the intensity of those wave lengths of light falling between 2900-3200 A. U. is reduced the possibility of sunburn will be diminished. If all active light is kept away there will be neither tanning nor burning, but if the intensity of this light is merely diminished the effect will be the same as exposure to the sun for a few minutes instead of several hours and uniform tanning without burning will result.

The intensity of light can be lessened either by reflecting or absorbing part of it or by absorbing part of the active range only. Oils possess some small value in that they reflect a portion of the light. Opaque pigments like zinc oxide or titanium oxide prevent light of any kind from reaching the surface they cover. The modern screening preparation contains some sort of light filter which lessens the intensity of active rays without eliminating them completely, *i. e.*, a compound or mixture with strong absorption bands covering the region from 2900-3200 A. U.

The choice of screening agent must be made on the basis of absorption. The error of assuming that a particular substance possesses absorptive power simply because it fluoresces should not be made. Further, the possibility of local skin reactions as the result of its use must not be overlooked. Among the various substances that have been recommended as screening agents are esculin, umbelliferones, menthyl, benzyl and phenyl salicylates, salts and derivatives of hydroxyquinolines, quinine salts, naphthol and naphthylamine sulfonic acids, hydroxynaphthoic acid and many others. The original article gives a very instructive and valuable discussion as to the proper formulation of liquid and solid sunburn preventative preparations in which many important points are emphasized which should not be disregarded by anyone desiring to market this class of products.

BOOK REVIEW

PHARMAKOGNOSTISCHER ATLAS.

The pharmacognostic atlas, prepared by Ddrs. Flueck, Schlumpf and Siegfried, describes and illustrates in 436 original microphotographs and drawings, and 446 pages, the vegetable drugs official in the new Swiss Pharmacopœia, 5th ed. The book is published by Wepf and Co., Basle, Switzerland, and is priced at 35 Swiss-Francs. The text is in German.

Obviously the authors have achieved their aim (1) to facilitate the practical examination of vegetable drugs, (2) to serve as a textbook of drug anatomy for pharmacy students, (3) to assist microanalysts in the examination of those foods or spices, official in the Swiss Pharmacopœia, (4) to benefit foreign workers, in whose country the same vegetable drugs are official.

With the exception of but a few illustrations, as those of radix levistici (Fig. 325), radix scammoni (Fig. 341), folia uvae ursi (Fig. 196), the microphotographs of sections (usually stained) are excellent. The drawings of the powder elements are carefully executed and splendidly reproduced, though one might wish, for sake of further details, that some had not been reduced to the uniform scale of 180 magnification.

The arrangement is exemplary; only in few instances, as in bulbus-scillae, carrageen, cortex sarsaparillae, chamomile, flores Koso, radix taraxaci, and some others, could the combination of text and illustration be improved. By partial rearrangement it could, no doubt, be avoided, that drawings of powder elements of one drug (not labeled at all in such cases as on pages 68, 74, 210, 216 and 362) would be faced on the adjoining open page by the description of another drug.

The reference to diagnostic elements, to sizes of elements and to cell inclusions as starch, latex, resin masses and other secretions, are very helpful. In our opinion other microchemically diagnostic inclusions as tannins and pigments, as in the case of barks and of saponins, might well be included in the next revision.

The references to the presence of calcium oxalate sand in the folia and radix belladonnae need revision, inasmuch as this crystal sand does not have the characteristics of calcium oxalate; its nature

being still obscure. As cork has replaced the epidermis in the drug gentian, the designation "epidermis" in Fig. 319 should be corrected.

The choice of paper, the printing and binding, do credit to the publishers, the atlas does credit to the authors, who have obviously spared no trouble to present a work equalling the best now available in the illustration of diagnostic vegetable drug anatomy.

ARNO VIEHOEVER.